Application Note APN04

Analyzing Cereals and Flour using mylab NIR spectroscopy

Introduction

Cereals are natural products. Variety, origin, growing conditions and storage influence their composition and consequently their behavior during processing. For mills and cereal-processing companies, efficient production therefore begins with a clear understanding of raw material quality.

The mylab NIR-Analyzer

The mylab NIR-Analyzer provides key information about the composition of milk and dairy products in less than a minute. Raw materials can be characterized as early as the receiving stage and allocated to different production processes based on their composition.

During production, rapid measurements help ensure that product formulations and batches meet the desired target values. This makes the mylab NIR-Analyzer a fast and cost-effective alternative to a wide range of conventional wet-chemical laboratory methods.

Analyzing Samples of Cereals and Flour

The sample is placed in the sample dish, which is then positioned on the measurement field of the instrument. The sample measurement is completed within seconds, and the selected parameters are quantitatively determined.

Experimental

For sample analysis, approximately 100 g of flour and cerals respectively was placed in a sample dish. In total, 100 samples were first measured using the mylab NIR-Analyzer and was subsequently sent to the reference laboratory (Prueflabor fuer Lebensmittel, fzmb GmbH) for chemical analysis.

The following parameters were determined: gluten, protein, ash, and product moisture. The calibration models were generated using the reference values and the corresponding NIR spectra, as described in Schewtschenko et al.[1]



Fig.1. The mylab NIR-Analyzer.

[1] *Calibration of the mylab NIR-Analyzer in Food Analysis. 2025. Schewtschenko O, Meuche F., Muecke A, Wietstock S, and Heise J. 2025. White Paper*

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Results and Discussion

To assess the performance of the mylab NIR calibration models, the coefficient of determination (R^2) was used. R^2 indicates how well the NIR-predicted values agree with the corresponding reference values. Values closer to 1 indicate a stronger agreement between predicted and reference values.

Table 1 summarizes the calibration statistics for four parameters measured in 100 different samples of flour and cereals: protein, gluten, ash and moisture. The range represents the lowest and highest reference values included in the calibration dataset and indicates the concentration range covered by the calibration model.

The coefficients of determination (R^2) range from 0.97 for product moisture, 0.97 for protein, 0.89 for gluten and 0.79 for ash. Increasing the sample size may lead to a stronger correlation between the NIR-predicted values and reference values. Figures 2–5 show scatter plots of the NIR-predicted values versus the corresponding reference values for the four parameters.

Table 1. Statistics of mylab NIR-Analyzer measurements.

Parameter	n	Range	R^2
Gluten (g/100g)	100	3.4 - 24.4	0.99
Salt (g/100g)	100	0.25 - 1.1	0.89
Moisture (g/100g)	100	57.3 - 78.6	0.99
Ash (g/100g)	100	0.49 - 0.86	0.79

Conclusion

This application note demonstrates that the mylab NIR-Analyzer is an effective tool for the rapid determination of key compositional parameters in cereals and flour.

The NIR-predicted values for gluten and protein showed perfect agreement with the corresponding reference values. The NIR-prediction for values of salt and moisture show good correlation with corresponding reference values. Even higher agreement may be obtained by increasing the number of samples in the dataset.

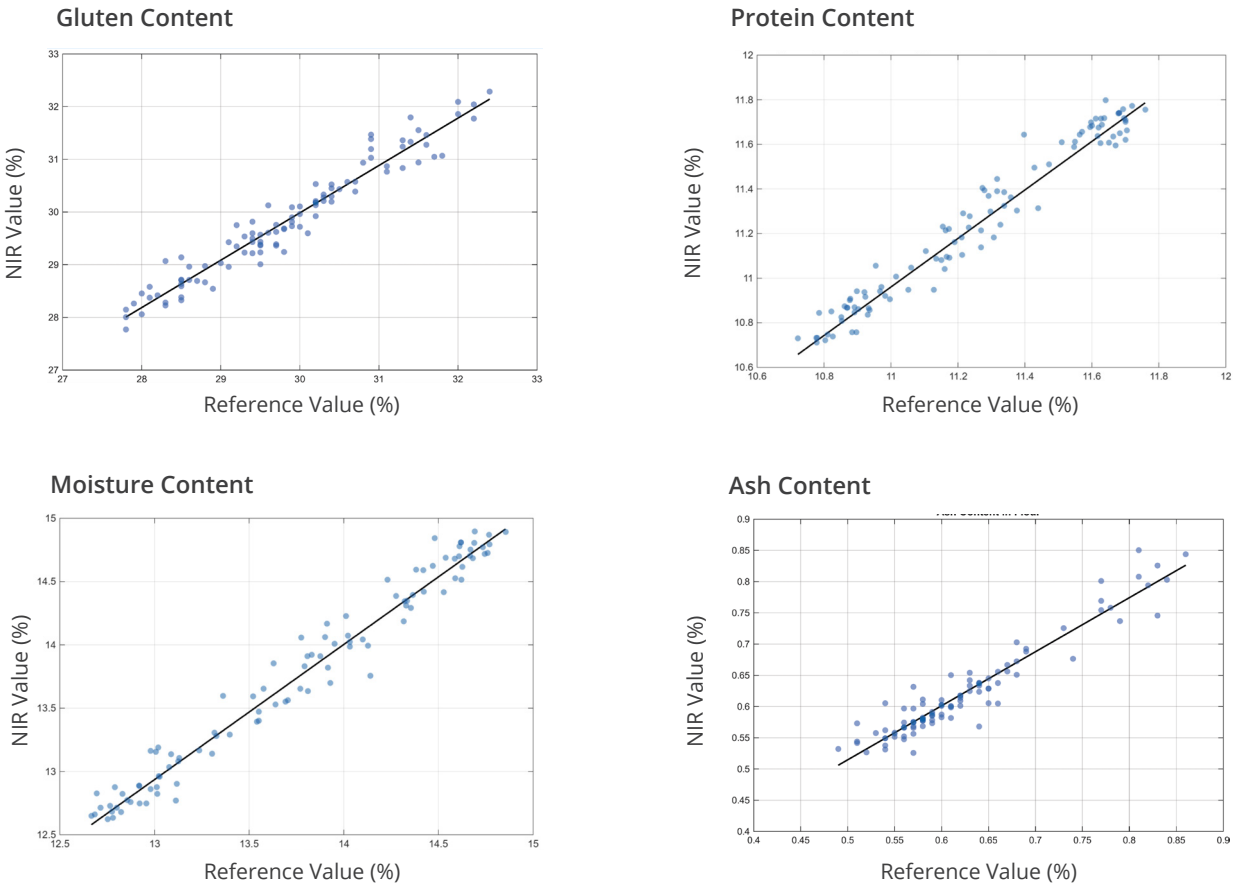


Fig. 2-5. Scatter plots of NIR-predicted and reference values for different parameters in 100 samples of different flours and cereals. NIR values were acquired using the mylab NIR Analyzer, while reference values were obtained from the Prueflabor fuer Lebensmittel (fzmb GmbH).

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